

[54] **METHOD FOR PREPARING PRIMER FOR PERCUSSION-IGNITABLE FLASH LAMP**

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 [58] **Field of Search** **149/30, 31, 77, 37, 83, 149/42, 85, 44**

[56] **References Cited**

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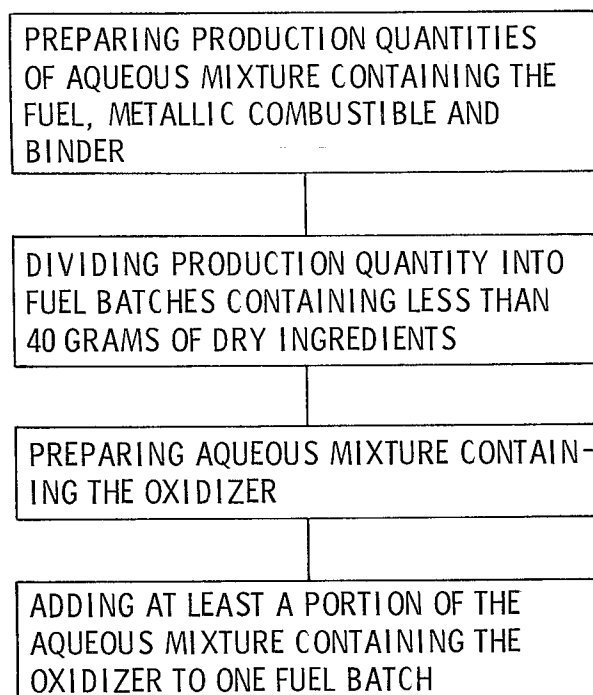
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[57] **ABSTRACT**

An efficient method of preparing a coating preparation for use in a single step coating of primer for percussion-ignitable flash lamps, providing a combination of efficiency and safety in handling during manufacture. A production quantity of an aqueous mixture is prepared, containing the fuel, the metallic combustible, and the binder, but without the oxidizer. The production quantity is then divided into at least three fuel containing batches each of which contains less 40 grams of dry ingredients. An aqueous mixture comprising the oxidizer is prepared and at least a portion of this aqueous mixture comprising the oxidizer is added to the fuel containing batch one of the fractions of the production quantity. In this manner most of the ingredients are prepared in large production quantities but the danger of having serious accidents from accidental reactions involving the large production quantity is avoided. Preferably the oxidizer is sodium chlorate.

6 Claims, 1 Drawing Figure



METHOD FOR PREPARING PRIMER FOR PERCUSSION-IGNITABLE FLASH LAMP

BACKGROUND OF THE INVENTION

This invention relates to percussion-ignitable flash lamps, and more particularly to primer materials which are used to initiate the flashing thereof. The primer is a charge of percussively sensitive material located within a readily deformable metal ignition tube, sealed to and projecting from one end of a length of glass tubing which forms the glass envelope. The glass envelope encloses a quantity of shredded combustible metal. Flashing is initiated by a mechanical impact against the side of the metal tube to deform it against the coating of primer material which causes the ignition of the primer material and some of the primer material, (particularly the metallic combustible) is blown into the body of the envelope where the shredded combustible metal ignites to generate a flash of light.

The primer material, being easily ignitable, provides significant dangers to personnel during manufacture. The primers typically contain fuel, oxidizer, metallic combustible, and binder. Although the binder material is less sensitive when wet, a single coating preparation (one which contains both the fuel and the oxidizer) presents handling hazards even when wet. Even though the material in a water based coating preparation is generally not directly mechanically ignitable, a small amount of the material can easily dry on the sides of the container and, if mechanically ignited, will cause reaction of the entire contents of the container (including the portion of the preparation which has not dried). Heretofore, the primer material has generally been prepared as very small batches of a single step coating material (containing both the fuel and oxidizer). This method is inefficient. In this process excessive time is spent in preparing the coating preparation.

Typically, the oxidizers used in the percussion-ignitable flash lamps have been partly or solely potassium chlorate. Potassium chlorate however is not readily soluble in water and produces inconsistencies in ignition as the mixture is non-homogeneous. Typical primers also use red phosphorous as the fuel with a weight ratio of red phosphorous to oxidizer of about 2. The red phosphorous in this amount however, produces a coating preparation which dries in a rough pattern and thus increases the possibility of premature ignition. In addition, red phosphorous discolors the bulb wall and thus a larger quantity reduces the light transmission.

SUMMARY OF THE INVENTION

An improved method of preparing a coating preparation for single step coating of a primer material for percussion flash lamps has been discovered which combines the efficiency and accuracy of a single step coating and the efficiency and accuracy of large batch preparation, while still providing for safety in handling during manufacture.

A production quantity of an aqueous mixture containing most of the primer ingredients, but not containing the oxidizer, is prepared. The production quantity contains at least 100 grams of dry ingredients, (the dry ingredients include fuel, the metallic combustible, and the binder). The production quantity is divided into at least three fuel containing batches, each fuel containing batch containing less than 40 grams of dry ingredi-

ents. An aqueous mixture containing the oxidizer is also prepared. At least a portion of the aqueous mixture containing the oxidizer is added to one of the fuel containing batches to form the coating preparation for use in the single step coating of the primer.

Preferably, the oxidizer is sodium chlorate (without any potassium chlorate) and the fuel is red phosphorous. Preferably the weight ratio of sodium chlorate to red phosphorous is within 10% of 1:1. This reduced amount of phosphorous smooths out the coating and thus reduces the possibility of premature ignition. The reduced phosphorous also produces less light absorbing debris. The use of sodium chlorate which is readily soluble in water produces a homogeneous mixture which is more sensitive and is more consistent.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing, the sole FIGURE is a flow chart showing of the method of preparing a coating preparation for single step coating of primer for percussion-ignitable flash lamps.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the sole FIGURE, a production quantity of an aqueous mixture containing the fuel, metallic combustible, and binder is prepared. This quantity will contain at least 100 grams of dry ingredients. Typically the quantity will be enough for at least one day's requirements for one line's production of percussion-ignitable flash lamps. The production quantity is divided into fuel batches containing less than 40 grams of dry ingredients. This can be done by either dividing the production quantity of fuel containing mixture into several batches and then storing batches until they are needed or by maintaining the production quantity in a single container and withdrawing the amount required for an individual batch as required. An aqueous mixture containing the oxidizer is prepared. This can be either an appropriate quantity for mixing with an individual fuel batch, or a relatively large quantity from which the amount required for mixing with an individual fuel batch can be withdrawn. In either case (at least a portion of) the aqueous mixture containing the oxidizer is then added to one fuel batch. If the quantity of the aqueous mixture containing the oxidizer was only enough for one fuel batch, then of course the entire amount of aqueous mixture containing the oxidizer would be added to the individual fuel batch.

As the amount of mixture containing both oxidizer and fuel which can be safely handled is smaller than an individual line's requirements for a single day, multiple weighings of each of the dry ingredients would be required if a day's production were made as a series of small batches (i.e., not using the instant invention). These multiple weighings not only are time consuming but also lead to less accurate control of composition as accuracy of weighing generally decreases as the quantity weighed decreases.

The following is an example of a preferred coating preparation prepared by the method of the instant invention. 135 grams of titanium powder, 45 grams of red phosphorous, 2.7 grams of magnesium oxide, and 2.7 grams of hydroxyethyl cellulose are mixed with 135 millimeters of water to provide the production quantity. This production quantity is divided into six equal (by volume) batches, each containing about 30.9

grams of dry ingredients. 7.5 grams of sodium chlorate are mixed with approximately 10 millimeters of water. The above sodium chlorate solution is mixed with one of the six fuel-containing batches. As an alternative, the sodium chlorate can be mixed in larger batches and only a portion used with a fuel batch (for example, 45 grams of sodium chlorate can be mixed with 60 millimeters of water and this also is divided into six equal volumes, one for each fuel batch).

While potassium chlorate can also be used as an oxidizer in the instant process, sodium chlorate is preferred as it, being soluble in water, produces a homogeneous material which is more sensitive, and much more consistent. In addition, a weight ratio of approximately 2:1 of red phosphorous to sodium chlorate is typical of the prior art, but a ratio of 1:1 is preferred and this 1:1 ratio is preferably maintained within $\pm 10\%$. The ratio of titanium to red phosphorus is preferably maintained within about 10% of 3:1. Preferably the binder is hydroxyethyl cellulose and its weight ratio to red phosphorous is held within 30% of 0.06:1. Preferably a buffer (to keep the solution from turning acidic) is also used, preferably magnesium oxide with a weight ratio of magnesium oxide to red phosphorous of within 30% of 0.06:1. A wide range of ingredients will function and can be used with the instant method, however, the above blend is preferred and should be accurately controlled to provide the proper range of sensitivity.

While red phosphorous is the preferable fuel it is also possible to use other fuels such as sulfur, carbon, and antimony sulfide. Other materials which can also be used include potassium chlorate, potassium perchlorate, or potassium nitrate as oxidizers, zirconium powder as the metallic combustible, hydrolized polyvinyl alcohol or methyl cellulose as the binder, and aluminum oxide as the buffer. These substitutions can be used in the same amounts as the original ingredient which they replace.

Whatever combination of ingredients are used, it is desirable to maintain the composition of the primer within quite tight limits (especially the critical ratio of oxidizer to fuel which should be held within 10% and preferably even within 5%). Single coating techniques with small, individually mixed batches incur problems in that excessive direct labor is required first to mix the large number of batches and secondly to measure the ingredients of these batches to the required degree of

accuracy with the small quantities involved. The instant invention combines safety, the required accuracy and economy of labor.

While the best mode of carrying out the invention has been set forth, it will be understood that modifications may be made without departing from the spirit of the invention and that the scope of the invention is defined in the following claims.

I claim:

1. An efficient method of preparing a coating preparation containing fuel, oxidizer, metallic combustible and binder for use in single step coating of primer for percussion-ignitable flash lamps, which method provides a combination of efficiency and safety in handling during manufacture, said method comprising:

a. preparing a production quantity of an aqueous mixture containing at least 100 grams of dry ingredients, said dry ingredients being fuel, metallic combustible, and binder;

b. dividing said production quantity into fuel containing batches containing less than 40 grams of dry ingredients;

c. preparing an aqueous mixture comprising said oxidizer;

d. adding at least a portion of said aqueous mixture comprising said oxidizer to one of said fuel containing batches to form said coating preparation for use in single step coating of primer for percussion-ignitable flash lamps.

2. The method of claim 1, wherein said oxidizer is sodium chlorate.

3. The method of claim 2, wherein said fuel is red phosphorous and the aqueous mixture comprising said oxidizer is added to said fuel containing batch in amounts such that the weight ratio of sodium chlorate to red phosphorous is within 10% of 1:1.

4. The method of claim 3, wherein said combustible metallic is titanium, and the weight ratio of titanium to red phosphorous is within 10% of 3:1.

5. The method of claim 4, wherein said binder is hydroxyethyl cellulose and the weight ratio of hydroxyethyl cellulose to red phosphorous is within 30% of 0.06:1.

6. The method of claim 5, wherein MgO is added to said fuel batch and the weight ratio of MgO to red phosphorous is within 30% of 0.06:1.

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